Commercial Aviation

TOWARDS AN IDEAL

An Unorthodox Pusher Monoplane Nearing Completion

The Sykes monoplane in a partially completed state. Note the dihedral on the tailplane; it is the designer's intention to dispense with the rudder.

READERS may recall that in "Flight" of October 17, 1935, under the heading "Is this the Private Owner's Ideal," there appeared a description and general arrangement drawing of a pusher monoplane designed by Mr. Norman Sykes. Mr. Sykes has since proceeded with the construction of the machine, and in the notes below gives further opinions on its possibilities. At the time of our original description the Editor made several criticisms, and certain of them are answered here by the designer.

THE illustrations show the partial materialisation of the design. The drawing, stressing and actual construction have been easy, due to the simple principles employed throughout the design.

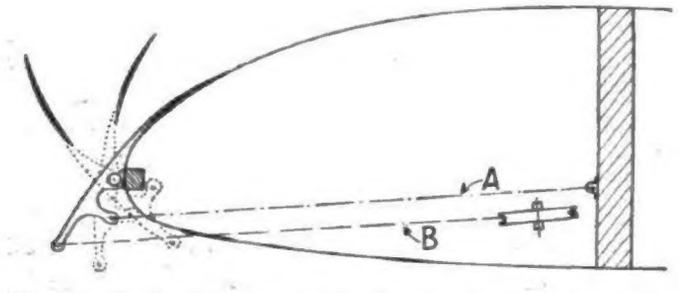
In the production of a cheap aircraft the present enormous overhead expenses of drawing, stress and inspection departments, must be drastically cut by dividing the design into simple self-complete units suitable for modern mass-production. The simple chassis and interchangeable tail planes are typical examples in this design. Also, all aerofoils have a single spar at the deepest part (.3c), the torsion, drag and high loading near the nose being taken by a substantial wing covering between the spar and leading edge.

The lightly loaded portion of wing behind the spar will be fabric-covered. This results in a wing virtually "mass-balanced" about the flexural axes, consequently reducing the risk of wing flutter without using heavy wing-stiffening (because Bleriot flew the Channel on two-spar wings that need not be the end of development).

To complete the immunity from flutter, the aileron design needs revision; again, because the Wright Brothers warped the trailing edge that need not be the best way of producing a rolling moment.

It is proposed to try out the method shown in the sketch, the scheme being to operate only on the down-going wing by opening a "spoiler" hinged near the leading edge. This reduces the lift and adds drag, and it is hoped thereby to eliminate the rudder, giving a much needed simplification of control.

Spoilers placed well forward on an aerofoil suffer from a short time lag between operation and effect. The spoiler has, therefore, been designed as a reversed "slot" in an attempt to rectify this fault. It will be noted that the weight of this control and its gear is helping to mass-balance the wing.



The "spoiler" referred to by Mr. Sykes. Three positions are shown. "A" represents a compression spring and "B" the operating cable.

This type of control should be very effective in recovery from a spin when fully opened on the "outside" wing.

It may be argued that such a control cannot be used for side-slipping, but the provision of adequate air-brakes will abolish the need for this distressing manœuvre. Sufficient directional trim for landing and compass flying is afforded by the steerable tail-wheel, which acts as a small rudder.

The actual making of this aircraft has suggested many additional desirable features, e.g., the fuel tanks are in the wing, and shoulders and vertical slots cut in the adjacent cabin sides allow a "boiler gauge" on each tank to be visible from the pilot's seat, thus solving very simply an often awkward problem.

Again, in the bulkhead behind the rear seat is a large triangular door giving easy access to the engine from the cabin. Thus, if cruising at 5,000 ft. and engine failure occurs, the twelve minutes available before forced landing can be spent in examining ignition and fuel systems with a chance of rectifying the trouble. (Tools are kept under the pilot's seat and the engine is actuated by kick-starter from the seat.)

General Impressions

In this design the chief criticism appears to be the sudden change of body section under the airscrew, which suggests a structural weakness. This, of course, is only an optical impression. The box-section chosen is better for run of controls, and is simpler, stronger and better-looking than a pair of outriggers from the wing. The box will also shield some airscrew noise from the luckless public below (who will eventually have to be considered), and will protect the airscrew from spray in the seaplane version.

The Editor previously queried the low tare weight claimed for this design, but the actual weights are confirming that estimate. There is bound to be weight-saving when the engine is only 18 in. from the c.g. This position of the engine will be of great benefit in the future when the refinements of free-wheel clutches, superchargers, etc., are demanded.

An ideal engine for this aircraft is needed, preferably having four cylinders of high r.p.m., and air- or water-cooled. There is ample accommodation in the engine-room for a flash-boiler and direct drive steam-engine (U.S.A., please note).

The addition of about 6 in. to the width would create an ideal "foursome" cabin with seats and doors similar to those of an automobile. There is no reason why the chassis should not be made four-wheeled or the present tail-wheel brought forward, just to the rear of the engine, in anticipation of a "roadable" model.

Finally, there seems to be great scope for the plastics industry in perfecting a reinforced material for cabins, tail-components, etc., and a finely corrugated sheeting or moulding for leading-edge coverings to replace smooth ply. This would eliminate the "tension diagonal fields" under torsion loading and result in a stiffer structure.

"The Aircraft Engineer"

AS announced last week, *The Aircraft Engineer* supplement to *Flight* is held over until next week's issue, October 1, owing to the pressure on space caused by the Johannesburg Race features in this issue.